

QUALITY OF SERVICE FOR VIDEO PACKET OVER PEER TO PEER
NETWORK USING ACTIVE MEASUREMENT

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ABSTRACT

The purpose of this project is to see the performance of Peer-to-Peer (P2P) network in Gnutella system. P2P are self-organizing networks that aggregate large amount of heterogonous computers called nodes or peers. In P2P systems, peers can communicate directly with each other for the sharing and exchanging of data, besides the data exchange these peer nodes also share their communication and storage resources. One of the P2P mostly used is Gnutella. Gnutella is feasibly and still firmly established as the third-largest peer-to-peer network. This project will observe the problem of real-time streaming of video packet over Gnutella system from a single sender to a single receiver. This project concentrate on the development of an optimum model using Gnutella system as well as evaluating of the quality adaptation of the streaming mechanism. The simulation process was done using NS2 with 3 scenarios, which are using bandwidth 512 kbps, 256 kbps, and 128 kbps. The simulation result shows that to achieve the good quality of sending video packet is using bigger bandwidth. It is also shows that delay time will increase when the traffic is full. In order to achieve the right bandwidth to send the video packet over the Gnutella system, it is depend on the frame rate, quantization and the resolution of the video packet.

ABSTRAK

Penyelidikan ini adalah bertujuan untuk mengkaji prestasi rangkaian *Peer to Peer* dalam sistem Gnutella. P2P adalah rangkaian pengurusan diri yang mempunyai jumlah kumpulan yang besar bagi computer yang berbeza dikenali sebagai nod atau *peers*. Dalam sistem P2P, *peers* dapat berinteraksi secara terus diantara satu sama lain dalam penukaran data. Selain itu, ia juga dapat berkomunikasi dan berkongsi sumber data. Salah satu sistem P2P yang sering digunakan ialah Gnutella. Gnutella adalah bersesuaian dan masih membangun sebagai rangkaian P2P ketiga terbesar. Masalah masa nyata bagi paket video dalam sebuah sistem Gnutella daripada pengirim kepada penerima dapat diperhatikan. Penyelidikan ini memfokuskan kepada pembangunan model optima menggunakan system Gnutella untuk menilai adaptasi kualiti bagi mekasnisma rangkaian. Proses simulasi menggunakan NS2 dengan 3 scenario yang berbeza yaitu menggunakan bandwidth 512 kbps, 256 kbps dan 128 kbps. Keputusan menunjukkan bahawa kualiti yang bagus bagi penghantaran paket video adalah menggunakan bandwidth yang besar. Ini menunjukkan bahawa masa tangguhan berkadar langsung dengan trafik. Beberapa aspek iaitu kadar rangkaian, kuantiti dan resolusi paket video mempengaruhi bandwidth yang sesuai bagi penghantaran paket video dalam sistem Gnutella.

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CHAPTER 1

INTRODUCTION

1.1 Background

Content sharing between communities has revolutionized the Internet. During the last few years. A new phenomenon had changed the Internet business model especially for ISP (Internet Service Provider). Peer-to-Peer (P2P) systems have gained tremendous intentions during these years. The P2P phenomenon is facilitating information flow from and back to the end users. Unlike traditional distributed systems based on pure client/server model, P2P networks are self organizing networks that aggregate large amount of heterogeneous computers called nodes or peers. In P2P systems, peers can communicate directly with each other for the sharing and exchanging of data, besides this data exchange these peer nodes also share their communication and storage resources. The characteristics of P2P systems make them a better choice for multimedia content sharing/streaming over IP networks. P2P systems are dynamic in nature where nodes can join and leave the network frequently and that might not have a permanent IP address and observe dynamic changes over the inter connection links. Virtual networks are built on the top of these networks at the application level in which individual peers communicate with each other and share both communication and storage resources, ideally directly without using a dedicated server.

The main concept of P2P networking is that each peer is a client and a server at the same time. P2P media sharing uses two basic concepts. In the ‘open after-downloading’ mode, the media content is played after downloading all the contents

of the file from different participants, while the ‘play-while downloading’ mode allows playing while downloading the content, which is commonly known as streaming. The ‘play-while-downloading’ has many advantages over ‘open-after-downloading’ as it requires less memory and the client is not expected to wait for a long time to finish download. In this thesis, we consider the Peer-to-Peer streaming problem is defined as a content streaming from multiple senders to a single receiver in the P2P network, i.e. a single receiver peer is receiving same content from different peers present in the P2P network. Multiple sender peers are selected on the fact that a single sending peer may not be able or willing to share an outbound bandwidth of actual playback rate. Dynamic behavior of P2P systems is another reason of selecting multiple sender peers for media sharing, as it is possible that any sender peer sharing media can leave/crash without any prior notification (Mubashar Mushtaq and Toufik Ahmed, 2006)

This project used one of the Peer to Peer that mostly used now, which is Gnutella. Gnutella is a system in which individual can exchange files over the Internet directly without going through a Web site in an arrangement which sometimes described as peer-to-peer. Like Napster and similar Web sites, Gnutella is often used as a way to download music or video files from or share them with other Internet users and has been an object of great concern for the music publishing industry. Unlike Napster, Gnutella is not a Web site, but an arrangement in which you can see the files of a small number of other Gnutella users at a time, and they in turn can see the files of others, in a kind of daisy-chain effect. Gnutella also allows you to download any file type, whereas Napster is limited to MP3 music files.

1.2 Problem Statement

Various approaches have been demonstrated in the past in integrated network. Peer-to-Peer (P2P) systems have gained tremendous intentions during these years. The Peer-to-Peer (P2P) phenomenon is facilitating information flow from and back to the end In P2P systems, peers can communicate directly with each other for

the sharing and exchanging of data. The characteristics of P2P systems make them a better choice for multimedia content sharing/streaming over IP networks. For many of these applications, it is important to observe the problem of real-time streaming of video packet over Peer-to-Peer networks (P2P) from a single sender to a single receiver.

In short, the problems presented by designing can be broken into:

- Understanding the capability of peer to peer system
- Understanding the operation theory and modeling of peer to peer system for the Gnutella system
- Understanding the operation of active measurement
- Understanding the operation theory of Quality of Service especially in queue, delay and RTT.

1.3 Objective

The aim of this research is to describe the design and measurement of Peer-to-Peer System for the Gnutella system using Active Measurement. To make things clear, the objective of this research can be broken down into:

- To investigate the video packet transmission over Peer-to Peer networks (P2P) in Gnutella system using the active measurement
- To investigate the performance of Peer-to Peer (P2P) networks

1.4 Project of Scope

This research will analyze the performance of Peer-to-Peer networks for video packet in Gnutella system using active measurement. The system will be

simulated using NS2 v2.26 with Operating System Fedora core 2. The project will focus on the Quality of Service which is using queue, delay and RTT.

In order to send the video packet in Gnutella system, the packet will send under the UDP protocol which is using 3 scenarios in the networks.

1.5 Methodology

The methodology of this project will follow the next flow chart:

1. Through literature work and review on Quality of Service of peer-to-peer performance.
2. Design and analysis the topology of the Gnutella system.
3. Modelling and run the simulation of the Gnutella system using NS2.26 with operating system Fedora core 2.
4. Performance analysis of the QoS networks video packet over Gnutella networks using active measurement
5. Report writing

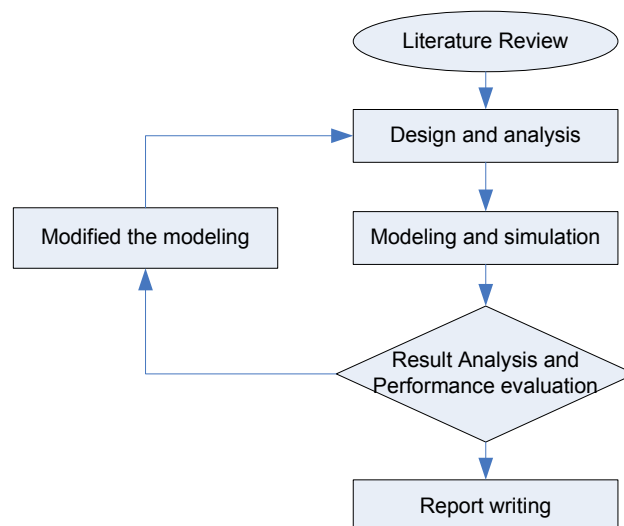


Figure 1.1 Flowchart of the methodology

1.6 Organization of Project Report

This project report consists of five chapters describing all the work done in the project. The project report organization is generally described as follows.

The first chapter explain the introduction of the project and problem this project try to solve which describe the motivation of this project. This chapter sets the work flows according to the objectives and scope of project.

Chapter two will discuss the theories of Peer to Peer system, Quality of Service, and the Active measurement.

Chapter three will present the steps on designing the Gnutella simulator, the software used for design and simulation, the structure of the designed Gnutella, and the measurement techniques.

Result and analysis are presented in chapter four to compare the performance of the Gnutella system.

The last chapter highlights the overall conclusion of the project with future work suggestion to improve QoS of the Peer to Peer network. The project is summarized in this chapter to give general achievements and the future improvements can be made by other researchers in the future.

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